**Progress in LHCD modeling and experiments towards AT regime on Alcator C-Mod***

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A goal of the LHCD program on Alcator C-Mod is to approach an advanced tokamak (AT) regime through the modification of the current profile. Fully non-inductive operation has been demonstrated at a current of ~ 0.5 MA and at a density close to what is expected on ITER steady state operation. MSE pitch angle measurement showed that these plasmas had a flat or weak reversed shear profile, and TRANSP modeling of the current profile evolution is in good agreement with experiment. Some of these discharges exhibited the formation of an ITB on the electron temperature profile. This barrier formation was always observed about 200-300ms (longer than the current penetration time) after the turn-on of LHCD and often ended with a collapse associated with an m=2 pre-cursor, suggesting the importance of q-profile modification for the ITB development. Modeling has been performed to explore the possibility to approach high density, high f_BS regimes from these plasmas, while avoiding the degradation of LHCD at high density. A simulation using GENRAY/CQL3D with SOL suggests that a key is to maintain good single pass power absorption, while increasing the density. Details of the modeling and experimental results to verify the modeling will be presented.
*Supported by US DOE Awards DE-FC02-99ER54512 and DE-AC02-09CH11466